Courtesy Photos

The ejection seat blasts ADAM out of the cockpit during an F/A-22 launch to test the ejection seat.

ADAM & JPATS

Test dummies take the hits to ensure pilot's survivability.

by Airman 1st Class Vanessa LaBoy
49th Fighter Wing Public Affairs

Suited up and strapped in the cockpit, ADAM is ready for another egress test which will push his body to the limit.

ADAM is an Advanced Dynamic Anthropomorphic Mannequin, programmed to "feel" and record the strain and impact that might be felt by a pilot during ejection. Each of his limbs are similar to a human limb. All of his joints are designed to match a person's range of motion and joint rotation. ADAM represents the size and weight of the pilots that could be assigned to fly Air Force missions.

In order for the test to work properly, technicians ensure ADAM is wired correctly so he will record correct readings during the aircraft egress test.

The 746th Test Squadron uses instrumented mannequins and ejection seats to show if changes in mechanical design, flight gear or egress systems make an ejection safer or decrease the pilot's survival.

Tests provide data to medical personnel and mechanical engineers to determine if an egress is survivable.

"Mannequins allow us to simulate the pilot in a live testing environment," said George Gregory 746th TS instrumentation flight chief. "Egress testing performed at the Holloman High Speed Test Track is a critical ingredient necessary to collect this information for the aircraft manufacturer."

The work the 746th TS not only affects Holloman's mission, but every Air Force aircraft that has egress system responsibilities, including the A-10, F-15, F-16, F/A-22 and future ejection systems for the Air Force inventory.

The 746th TS is the only place in the Air Force that uses egress mannequins like ADAM to measure stresses from ejection. ADAM will record stresses such as limb movement, lower leg strain and torque.

The 746 TS also uses a Joint Primary Aircraft Training System, which is a simpler device that reads the stresses that a pilot's head and spine sustains during ejection. This includes compression, stretch, twisting, acceleration, deceleration and impact.

The data from both the mannequin and the ejection seat are channeled into the DAS (Data Acquisition System).

The DAS is a recorder. After it's triggered, it records each channel for a predetermined time interval. It can receive 10,000 samples per second per channel. They have 40-channel and 64-channel DAS systems.

"The engineer will create a requirements sheet that group together the outputs and assigns DAS channels for the instrumentation needed to get those readings," said Tom McDaniel, 746th TS electronics technician. "The mannequins are wired to specifications."

ADAM contains over 1,600 feet of wire and requires over 160 hours of work even before an engineer inspects to ensure the Mannequin is programmed correctly to get the information needed.

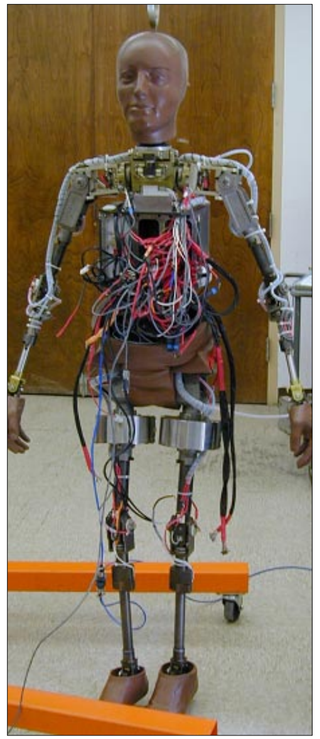
After movement of the mannequin, dressing him, and placement in the seat he is tested for wiring and connector damage. Technicians test ADAM at least 25 times before he goes down the track.

Each sensor's output must be clean, with no noise or crosstalk. Each measurement from the sensors to the DAS must be certifiable and repeatable.

"The mannequin must be set up so that the movements are natural, the weight is correct and the center of gravity is proper for a human," McDaniel said. "The data must be recoverable and understandable."

Once the test is complete, visible damage is noted and data from the DAS is retrieved from ADAM's ribcage. The information from the mannequin along with the information from the seat are sent to the agency to analyze and make any changes needed to create the safest aircraft to fly.

ADAM is strapped into the cockpit of an F-22 to test the ejection seat.



ADAM has over 1,600 feet of wire that is used to program ejection information.

The mannequin tests whether an ejection is survivable or not. If a pilot needs to eject, he needs to know if he'll make it out safely.

The mannequin, coupled with the ejection seat, shows that our current state of the art and projected egress systems work," McDaniel said.

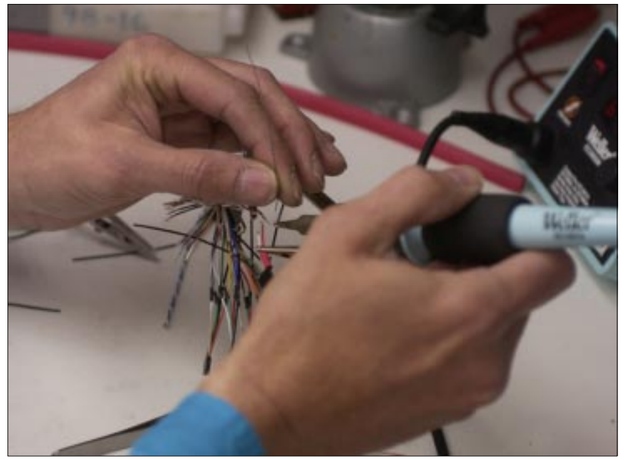


Photo by Airman 1st Class Vanessa LaBoy

Tom McDaniel 746th TS electronics technician, solders wires from a harness.

Photo by Airman 1st Class Vanessa LaBoy

Inspectors look over wires and connectors for damage on ADAM before the test.